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AN INVESTIGATION OF THE ELECTROCHEMICAL BEHAVIOR OF GRAPHITE FI--ETC (U)  
APR 82 G E STONER, G L CAMEN DAA629-79-G-0027  
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AN INVESTIGATION OF THE ELECTROCHEMICAL BEHAVIOR  
OF GRAPHITE FIBER-POLYMER COMPOSITES

FINAL REPORT

Contract No. DAAG29-79-G-0027

Submitted by:

G. E. Stoner

G. L. Cahen, Jr.

APRIL 1982

Submitted to:

Department of the Army  
Metallurgy and Materials Science Division  
U. S. Army Research Office  
P. O. Box 12211  
Research Triangle Park, NC 27709

Attention: Mr. Richard O. Ulsh  
Chief, Information Processing Office

Project Period: December 1, 1978 - January 30, 1982

Department of Materials Science  
RESEARCH LABORATORIES FOR THE ENGINEERING SCIENCES  
SCHOOL OF ENGINEERING AND APPLIED SCIENCE  
UNIVERSITY OF VIRGINIA  
CHARLOTTESVILLE, VIRGINIA  
RLES Report No. UVA/525119/MS82/102

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18. SUPPLEMENTARY NOTES The view, opinions, and/or findings contained in this report are those of the author(s) and should not be construed as an official Department of the Army position, policy, or decision, unless so designated by other documentation.		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number)  electrochemical composites		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) The factors influencing the use and stability of graphite fiber polymer matrix composite electrodes have been determined. Several possible uses of these electrodes have been examined for scientific feasibility.		

## SECTION I: STATEMENT OF PROBLEM(S) STUDIED

The factors influencing the performance and stability of graphite fiber polymer matrix composites were investigated. These factors were:

- 1) Matrix material
- 2) Fiber alignment
- 3) Fiber modulus
- 4) Electrochemical waveform
- 5) Solution composition

These variables were examined extensively and reported on in the first three (semiannual Progress) Reports.<sup>1-3</sup>

The second phase of the three-year study concentrated on examining the use of graphite fiber-polymer matrix composites for applications which have potential value to the Department of Defense. These studies were basic in nature and concerned with scientific feasibility for performing specific research tasks. These areas were:

- 1) Electrochemical Disinfection
- 2) Electrochemical Regeneration of Enzyme Cofactors
- 3) Electrochemical Breakdown of Chemical Wastes
- 4) Use of Composite Electrodes for Antifouling Purposes

The results of these studies were encouraging and, as a result of their being presented at several U.S. Army Conferences, have generated several possibilities for future work within the Army. These results are contained in the last three semi-annual progress reports<sup>4-6</sup> plus two trip reports.<sup>7,8</sup>



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## SECTION II: REPORTS

- 1) First Semiannual Progress Report for DAAG 29-79-G-0027. "An Investigation of the Electrochemical Behavior of Fiber-Polymer Composites." June 1979. Glenn E. Stoner, George L. Cahen, Jr., and Gery R. Stafford. Report No. UVA/525101/MS79/101.
- 2) First Annual Progress Report. Glenn E. Stoner and George L. Cahen, Jr. Report No. UVA/525101/MS79/102. January 1980.
- 3) Second Semiannual Progress Report. June 1980. Glenn E. Stoner and George L. Cahen, Jr. Report No. UVA/525101/MS80/103.
- 4) Second Annual Progress Report. January 1981. Glenn E. Stoner and George L. Cahen, Jr. Report No. UVA/525101/MS80/104.
- 5) Third Semiannual Progress Report. June 1981. Glenn E. Stoner and George L. Cahen, Jr. Report No. UVA/525119/MS81/101.
- 6) Third Annual Progress Report. January 1982. Glenn E. Stoner and George L. Cahen, Jr. Report No. UVA/525119/MS82/101.
- 7) A report to Dr. John Hurt, dated November 4, 1980, reporting on our participation at the third annual composites review (ARO/AMMRC Workshop in Watertown, Mass). Also a follow up report to Dr. Hurt dated December 1, 1980.
- 8) A report to Dr. Robert Reeber, dated November 30, 1981, documenting our activities at the CSL conference at Aberdeen Proving Ground, November 16-18, 1981. This report also contained the results of a trip to U.S. Army MERADCOM, Fort Belvoir, Virginia, on November 23, 1981.

## SECTION III: PERSONS SUPPORTED ON CONTRACT

G. E. Stoner  
G. L. Cahen, Jr.  
G. R. Stafford  
S. M. Lipka

#### SECTION IV: GRADUATE DEGREES EARNED

Gery R. Stafford, Ph.D. in Materials Science, 1980.

#### SECTION V: PUBLICATIONS

- 1) Stafford, Gery Ryan, Ph.D. Dissertation, University of Virginia, 1980.
- 2) Cahen, G. L. Jr., and Stoner, G. E., "Electrolysis Electrode," U.S. Patent #4,285,796, August 1981.
- 3) Stafford, G. R., Cahen, G. L., Jr., and Stoner, G. E., "Graphite Fiber-Polymer Matrix Composites as Electrodes," to be submitted for publication.

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